CM Information Management
Future Concept of Operations (CONOPS) and
Information Architecture Design Strategy
Version 1.0

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Abstract

This paper defines the conceptual framework, strategic direction and phased approach for designing, developing and implementing the FAA Configuration Management (CM) Information Architecture.

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Executive Summary

Configuration Management (CM) is a vital component of National Airspace System (NAS) life cycle management. CM is a discipline applying technical and administrative direction and surveillance to: identify and document the functional and physical characteristics of a configuration item (CI); control changes to those characteristics; record and report change processing and implementation status; and audit documentation and CIs to ensure adequacy of the baseline that is being established. It is FAA policy that CM shall apply to all systems, subsystems and components of the National Airspace System (NAS), including the documentation describing the NAS. The management of CM information is critical to the operation of CM functions and activities, and to the effective and efficient management of FAA systems throughout their life cycle.

Over the past year, the FAA's CM Authority (ACM, formally ASD-200) and the Configuration Management Steering Group have forged a partnership to increase CM awareness and to pursue initiatives to improve and strengthen agency CM capabilities. One area of particular interest is CM information management. A CMSG-sponsored, cross-organizational CM Information Management (CMIM) Team has made significant progress documenting CM stakeholder needs and the "as-is" CM information architecture[1]. Since completion of that effort, the CMIM Team has conducted gap analyses, defined automated tool requirements, developed NCP workflow documentation, pursued a competitive procurement (in partnership with ANS-100), enhanced the corporate CM web page, identified related agency information management initiatives, established partnerships, and developed a data dictionary framework.

To ensure that these many initiatives are well orchestrated and integrated down the road, the CMIM Team has established a long-term vision for CMIM that addresses the documented requirements of CM stakeholders:

An FAA CM information environment
that provides CM stakeholders
timely access to accurate, reliable and cost effective CM information
needed to support operations and business decision making.

A "road map" is needed to help us attain this very important CMIM vision. The components of this "road map" are the Concept of Operations and the CM Information Architecture Design Strategy.

The "Concept of Operations" or CONOPS defines some of the key attributes of this future environment. Such attributes are key in the continuing design and development process, to ensure that CMIM efforts meet CM stakeholder needs and expectations. The CM Information Architecture Design Strategy, builds upon theories and concepts of noted Information Architects Steven H. Spewak, and John Zackman, as well as FAA lessons learned from the NAS Information Architecture and FAA Corporate Systems Architecture initiatives. It proposes a strategy to incrementally design and implement a standards-based architecture that supports FAA CM business needs over the next three years. While initially focusing on the need to define and understand business operations, the strategy seeks to identify the data needed to support the operations and decision making inherent in the life-cycle management of the NAS. From there, information management solutions are then developed to that enable the FAA's CM business to operate in an efficient and effective manner. Such solutions will include new policies, procedures, standards, and application of information technology where appropriate.

[1] Configuration Management Needs and Sources Report, Final Edition January 1999

This CONOPS and Design Strategy also provides a general framework for data, applications and technology by defining the desired characteristics of the target CM Information Architecture. This target or desired "end-state" will be used to help focus near and intermediate term CM information management activities. The future information and data management, technology and business management environments are described. Graphical, conceptual frameworks for this future state are also provided in the appendices.

Some of the key components addressed in the CONOPS are summarized below:

Concept of Operation
- Future Environment -

Information and Data Management Environment

Information and Data Integrity
Broader Range of CM Data Available
CM data Administration, Policy and Standards
CM Corporate Database

Technology Environment

Web-based Enterprise Automated Tool
Corporate Database
Intranet backbone and Corporate CM Portal

Business Environment

Baseline Integrity
Decision Support
Continuous Process Improvement
Elimination of Costly Duplicative Practices
Traceability of Requirements to Actual Installed Base
Paper is the Exception Rather than the Rule

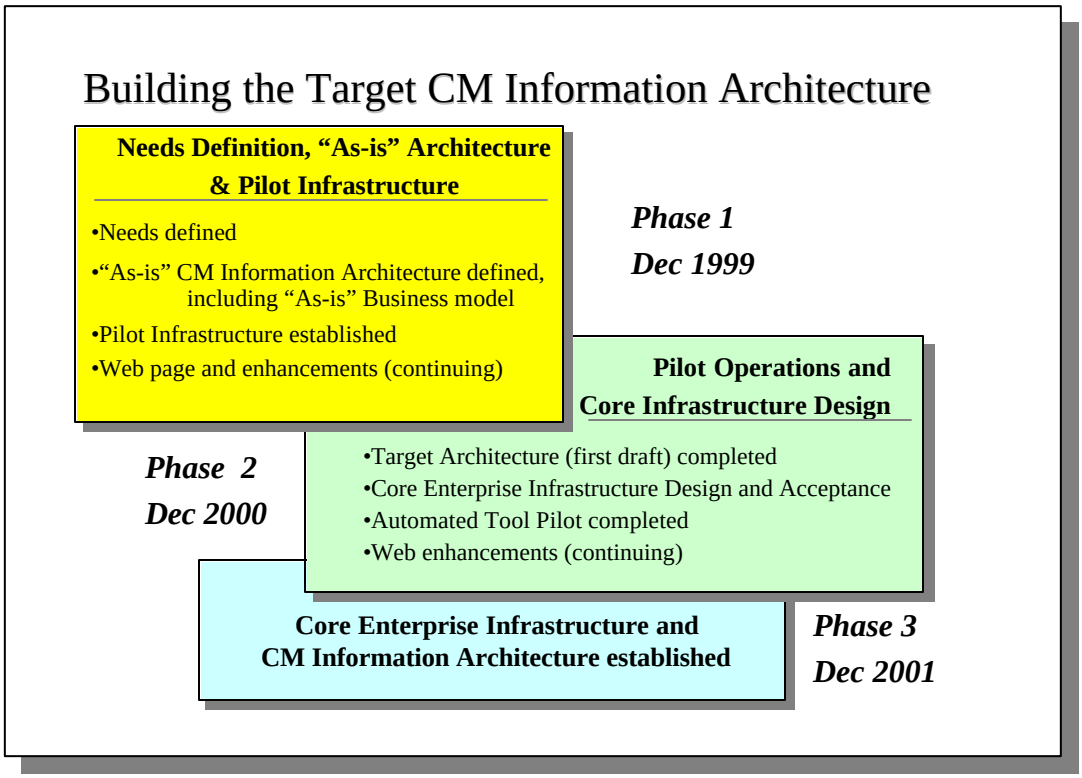
Thanks to the extraordinary potential of web-based technology, enhanced automated tools, and other information technology initiatives throughout the FAA, CM effectiveness can improve dramatically. On-going initiatives that will fuel this progress include:

- ***Enterprise automated tool pilot*** sponsored by ACM and ANS,
- ***Modification Tracking*** co-sponsored by NAS Operations (AOP) and Systems Architecture (ASD),
- ***Requirements tracking (Document Object Oriented requirements System (DOORS))*** sponsored by ASD and ARS,
- ***Asset Supply Chain Management (ASCM) requirements*** sponsored by NAS Requirements (ARS),
- ***Operational system documentation on-line*** now being deployed on the FAA interweb by NAS Operational Support (AOS), and
- ***Status accounting and NCP processing*** now being pursued by AUA.

These initiatives provide enormous potential to enhance CM effectiveness. However, we must ensure that these related efforts integrate, rather than duplicate.

ACM will serve as the agency "CM Information Broker," working behind the scenes with other partners to provide seemless access to needed information. The future CM stakeholder desktop will provide broader access to a wide range of information, including Computer-Aided Enginerring Graphics, Status Accounting Data, installed configuration data and much more. The needed business and data analysis will be done first to ensure that information requirements are justified and to tailor automated tools accordingly. The Enterprise Automated Tool, Corporate CM Database and the Internet will provide key technology infrastructure tools to make such access a reality.

This document provides a phased three-year program to design, develop and implement a standards-based architecture while integrating these key technology components over time. The chart below provides a high-level summary of CM Information Architecture and related activities through the next three years. Detailed resource requirements, project schedules and products will be documented in the CM Program Plan and CMIM Team Work-plans.



1. Introduction

This document presents a vision of the future CM Information Management (CMIM) environment, or Concept of Operations (CONOPS), and describes key attributes of that environment from business, information, data, and technology perspectives. It also presents a design strategy to incrementally create a standards-based corporate CM information architecture. This strategy is requirements-based, building on the existing CM information environment and stakeholder needs documented in the CM Information Needs and Sources Analysis as a starting point (see Appendix A).

The CM Information Architecture will provide the road map to guide agency CM information management initiatives, focusing CM information management efforts, promoting interoperability across initiatives and ensuring that the concept of operations will become a reality. This information architecture will take advantage of recognized information management and architecture principles, tempered by FAA business and budget realities.

It is intended to serve a resource to the CM Information Management Team and the CM Central Authority (ACM) as they promote the need for an agency-wide CM information architecture and the application of information technology to improve CM information accessibility, accuracy, and reliability over the next three years.

2. Background

In its briefing to the CMSG in February 1998, the Core Team identified CM information management as one key area of concern. Specifically, they reported that CM information was "Inaccessible, inaccurate and unreliable." Some of their examples included:

- Documented changes not implemented
- Changes not documented
- Distribution of CM data is limited
- Baseline data not accessible by all organizations
- Baselines audited for accuracy
- Validation of CM baselines not accomplished

The Core Team recommended that the FAA define CM information needs, establish a CM Information Architecture to guide future CM-related information management activities across the agency and to leverage information technology, where practical, to improve CM information management.

Based on the results of the recently concluded CMIM Needs Analysis and Sources investigation, we can confidently state that there are numerous opportunities to improve the way the agency manages CM information. [2] Figure 1 provides a high level summary of the information needs documented in the analysis.

[2] CM Information Needs and Sources, Final Edition, CMIM Team, January 1999

CM Information Requirements

- ***The ability to identify and communicate the existing operational configuration of NAS hardware, down to the Lowest Reportable Unit (LRU) level, and NAS software systems.***
- ***A process that provides all necessary information necessary to efficiently and effectively manage change proposals to the National Airspace System (NAS).***
- ***More timely access to CM-specific documentation, supporting documentation and CM basic information to execute CM and program management responsibilities.***
- ***Easily accessible and accurate drawings of commissioned sites and equipment.***
- ***An accurate and responsive FAA life-cycle corporate status accounting system.***
- ***Traceability from the NAS-level requirements to actual configuration items.***
- ***Other information to ensure efficient and effective CM operations.***

Figure 1

3. Linking the FAA CM Vision to Information Management

Configuration Management (CM) is a discipline applying technical and administrative direction and surveillance to: identify and document the functional and physical characteristics of a configuration item (CI); control changes to those characteristics; record and report change processing and implementation status; and audit documentation and CIs to ensure adequacy of the baseline that is being established. It is FAA policy that CM shall apply to all systems, subsystems and components of the National Airspace System (NAS), including the documentation describing the NAS. CM control begins with baselining of requirements documentation and ends with decommissioning of equipment in the operational NAS. The management of CM information is critical to the operation of CM functions and activities, and to the effective and efficient management of FAA systems throughout their life cycle.

ACM, in cooperation with the CMSG, have established an agency CM Vision that requires:

Dedicated CM Practitioners, Executing an Integrated FAA CM Discipline that:

- ***supports planning, life cycle management and decision making for FAA systems;***
- ***satisfies stakeholder needs with accurate, current information throughout the NAS life cycle;***
- ***demonstrates subsystem traceability to the NAS architecture;***
- ***reduces the cost of developing, deploying, operating and maintaining ATC systems and FAA facilities; and***
- ***is consistent with evolving FAA business practices.***

Of particular note is the need for accurate, current information throughout the NAS life cycle. After assessing Core team concerns and evaluating CM stakeholder needs, the CMIM Team has developed a vision to address these needs and issues:

CMIM Vision

An FAA CM information environment that provides CM stakeholders timely access to accurate, reliable and cost effective CM information needed to support operations and business decision making.

Fundamental to the successful attainment of such a vision is further detailed definition of business operations and business decision making data and information needs. Once these needs are fully documented through business modeling and data analysis, information technology can be applied to improve CMIM.

CM is performed in a distributed manner, following the product life cycle management. Numerous organizations are engaged and responsibilities sometimes become cloudy. This organizational structure, lack of clear policy and standards for CM information management are key contributors to the current state of CM information accuracy, reliability and accessibility. An integrated view of shared corporate NAS CM-related information, present and planned, should be made accessible throughout the agency through effective CM life-cycle information management. Moreover, a core set of CM information should be managed as a corporate, rather than a program, asset. This information is needed by multiple organizations to facilitate the effective and efficient life cycle management and integration of systems across the FAA.

The creation, capture and maintenance of information throughout the process is fundamental to CM effectiveness. Yet, minimal emphasis has been placed on CM information management. Recent EIA activities that highlight emphasis on digital data have helped provide greater visibility and emphasis for the need to focus on information management in the CM arena. Such information activities should be governed by corporate guidelines, procedures and standards to ensure accurate, timely and reliable information that can be shared across organization lines to facilitate NAS-wide CM. Timely, accurate and reliable information is fundamental to CM effectiveness.

4. Future CMIM Concept of Operations

In the future environment, FAA's investment in CM information and data management will be focused by a clear corporate direction and leveraged by the application of information technology. This investment will result in clear improvements in business operations and contribute to improved business decision making.

The following paragraphs move us forward three years. They describe the new environment in the year 2001, including the new information and data environment, information technology deployed and business operations.

4.1. Information and Data Management Environment

CMIM has gained increased visibility and prominence. The benefit of access to accurate and reliable CM data is due in large part to the way the agency deals with CM information.

Data Access. CM stakeholders contribute to and rely on the CM core data infrastructure for their CM and data and information. Access to technical data is ensured through the use of core corporate set of data elements and effective integration of various tools providing CM information throughout the NAS life-cycle.

Users have access to CM information quickly whether through the Enterprise Automated Tool, the CM Web site or as a result system interfaces. NAS MD-001 is automatically generated and available everyday. An NCP Workflow provides the framework for thorough change evaluations based upon agreed upon procedures and the application of "business rules" that govern the process. The NCP process is flexible and is widely used. Further, the workflow supports continuous process improvement by highlighting process bottlenecks and collecting key process metrics for analysis. Automation has contributed to significant reductions in process timelines and process analysis costs. Availability and access to data allows the evaluator and decision-maker to focus on technical issues rather than NCP status. Access to change status is reliable.

The introduction of ASCM and the integration of modification (mod) tracking capabilities have eliminated the need for "go-back" teams and has greatly facilitated efforts by second-level engineering organizations to improve the reliability of modification designs.

Agency stakeholders rely on digital information. The acceptance of contract CDRLs in digital form provides an essential foundation for life cycle systems management. A web-based distributed system or Program Support Libraries (PSLs) and improved tool-based drawing management provides the latest documentation quickly to all FAA sites.

Shared data definitions have contributed to increased interoperability as well as improved accuracy and reliability. These elements have been selected based upon a common need by multiple FAA organizations. A Configuration Control Board (CCB) resolves data issues and updates standards periodically to ensure that both corporate and individual stakeholder needs are satisfied. Traceability of system and sub-system data throughout the life-cycle is clearly evident in agency life cycle documentation (i.e., requirements, specifications, NCPs, ICDs CCDs, change authorization documents) and databases.

Information and data integrity. CM information accuracy, reliability and integrity have increased dramatically because duplicative databases and systems have been reduced or eliminated. CM stakeholders report data once, rather than supporting multiple headquarters management organizations. It appears that those who manage the CM information systems, mod tracking, requirements analysis, asset supply chain management and others really have their act together and are making stakeholder jobs a lot easier. Information security has been addressed, so concerns about unauthorized access have been allayed. Stakeholders can spend more time doing their jobs and less time reporting. The system has features that also benefit those who must report the data, a real selling point in gaining a high rate of stakeholder support.

Broader range of CM Data Available. Historically, corporate CM captured only status accounting metadata in the DOCCON. In this new environment, many other categories of data are now available; it is accurate, reliable and well managed. Some examples include:

- **Configuration Identification data.** The data that once resided in the Master Configuration Index. (MCI) has been expanded, with hyperlinks to actual digital representations of referenced baselined documents and related databases.

- **Status Accounting data.** Configuration status accounting (CSA) goes far beyond the metadata of the DOCCON system. Linkages to the Mod Tracking and ASCM databases are providing CM stakeholders with a true picture of all baselines and the physical installed NAS configuration. This highly reliable source of configuration information supports all program/project activities including program management, systems engineering, manufacturing, software development and maintenance, logistics support, modification and maintenance.[3]

- **Change Management Data.** NCPs are processed electronically. Now all NCP and worksheet data are housed in a database to facilitate process tracking and analysis.

- **Contractor-provided data.** All data and documentation provided by the contractor related to systems and modifications delivered by vendors is provided in standard digital form. The many man-hours the agency used to use in data transcription have been eliminated and have been refocused to program management and data analysis.

- **Baseline documentation and related data.** Specifications, drawings, technical instructions, maintenance manuals and other system documentation are maintained in through "virtual" Program Support Libraries. The FAA CM Internet Home Page serves as the new Document Control Center. ACM serves as the corporate "Information Broker," establishing and enforcing standards while managing the many links to on-line PSLs maintained by the IPTs, regions and AOS.

- **Program Management data.** IPTs and regions post their program management documentation on-line. This has greatly improved inter-program working relationships, planning, system development and system implementation activities..

- **Program metrics.** Data to measure various aspects of conducting CM as well as metrics to assess configuration evolution is routinely used to make program management decisions. iCMM goals are becoming easier to address because we have the information needed to document activities and assess effectiveness.

CM Data Administration, Policy and Standards. ACM has led the development of corporate CM information management policy, procedures and standards. Shared responsibility for data management and integrity. Those organizations with the best information about a NAS configuration item are responsible and accountable for providing that information in a timely, cost effective manner. Updated and consistent FAA CM guidance and standards for information and data management (i.e., operational procedures, electronic format for documents and drawings, drawing interchange standards) are published and maintained. Standards should be imposed on FAA contracts to facilitate the management and sharing of information.

A common set of standard core corporate data elements has been defined and standards published. These shared data definitions have contributed to increased interoperability as well as improved accuracy and

[3] Military Handbook, Configuration Management Guidance, MIL-HDBK-61, 30 September 1997, pg. 5-1

reliability. These common data elements have been selected collaboratively with the participation of CM stakeholders across the agency. ACM leads a Configuration Control Board (CCB) that resolves data issues and updates standards periodically to ensure that both corporate and individual stakeholder needs are satisfied. This CCB works closely with the NAS Information Architecture initiative to ensure consistency in NAS operational data naming conventions.

Published data interface standards are based largely on commonly agreed commercial (EIA) and Military (MIL-STD-2549) data interchange standards. Traceability of system and sub-system data throughout the life-cycle is clearly evident in agency life cycle documentation (i.e., requirements, specifications, NCPs, ICDs CCDs, change authorization documents) and databases. Standards for contract deliverables, including a core data elements and digital formats to facilitate information management and sharing across organizations, have helped the agency move away from paper to digital data. A Minimum set of Contract Deliverable Requirements Lists (CDRLs) and Data Item Descriptions (DIDs) for CM purposes are included in all related contracts.

CM Corporate Database. A distributed environment is in place that facilitates the clear assignment of data quality accountability (timeliness, accuracy and reliability), allowing access to needed data and providing flexibility to CM stakeholders to analyze and manipulate such data to meet localized needs. A central repository or corporate database serves as the foundation for corporate decision making. Appendix B illustrates this new environment.

Corporate Document Management Strategy. A national network of "Virtual" FAA Program Support Libraries (PSLs) is established. Each node in the network is maintained by the designated Offices of Primary Responsibility (OPIs) for the data, information and documentation maintained in such libraries. The network includes a national Library (DCC), one PSL in each IPT and Region, and one or more PSLs in the Second-Level Engineering organization (AOS). Guidelines and standards ensure consistency in information management and, to the maximum extent practical, these PSLs will be "virtual" (i.e., leverage the Internet/Intranet) to facilitate information access.

4.2. Technology Environment

Information technology has been employed to empower personnel with the capability to easily share information, initiate related processes concurrently, and make informed decisions in an efficient manner. The requirements, design and implementation of such technological solutions meet the specific information needs of the CM community throughout the FAA. The many islands of information that existed at the turn of the century have dwindled in number thanks to new automated tools and other technology application. However, the technology also enables data owners (e.g., IPTs, regions, etc.) to store and manage their data locally, helping to ensure data accuracy and reliability. The FAA's technology environment is robust and continues to evolve:

- Maintains an open architecture that is client and vendor independent, allowing the cost effective integration of new tools as they become available.

- Leverages installed FAA information technology base (standard FAA workstations, telecommunications infrastructure, e-mail, legacy systems, etc.). Fully integrating the CMIM tools and applications with the standard FAA infrastructure has minimized training requirements and maximized user functionality at the desktop.

- Provides distributed, client-server processing (maintaining the accuracy and reliability of data, information and documentation at the lowest possible level)

- Maintains transparent linkages to information sources throughout the agency through an enterprise tool and internet/intranet connection save CM stakeholders time as well as ensure they have the latest, accurate and reliable information from the right source. ACM serves an the agency's "CM Information Broker," working behind the scenes to establish and maintain these vital linkages.

- Uses browser technology provide enhanced human factors and ease of use.

The core infrastructure components include:

Web-based Enterprise Automated Tool. The enterprise tool serves as the core infrastructure to facilitate data collection and management for other CM information requirements. As the standard front-end for CM information applications, this PC-based COTS software is tailored to provide easy desktop access to NCP processing, status accounting, CM documentation and other related CM data to support life cycle systems management.

Corporate Database A corporate CM repository contains the core set of CM data. This data is collected on a regular, automated basis (schedule determined by the CMSG) from the IPTs, Regions and other offices as appropriate. This repository gives ACM and others with a need to know a view into the overall state of agency CM. The repository provides information such as the MCI, status of NCP processing throughout all IPTs, and so on. For example, ASD expects AUA to electronically submit their core CM data to the corporate repository. The corporate repository interacts with the EDMS tool, so that pre-formatted reports based on corporate data can be generated on an as-needed basis through the tool. Data includes documentation such as specifications, CDRLs, instruction books, and so on; change control data (e.g., NCP status); and any other data needed to conduct the business of the IPT (e.g., configuration item or software data). All IPTs, however, must store a core set of CM data in a format specified in the corporate CM Data Dictionary (see Section 5.2.2, "Data Architecture." This data is stored in any tool felt appropriate by individual IPTs. IPTs manage this data according to any process appropriate for the IPT. For unique localized requirements, IPTs and Regions store and manage their own data .

Intranet Backbone and Corporate CM Portal. The FAA Intranet provides the needed communications backbone for enterprise tool operation. In addition, the FAA Corporate CM Web page serves as the information source of choice, a "one-stop-shopping," so to speak, portal to CM information sources throughout the agency. ASD and the CMIM team work with agency CM stakeholders to incrementally enhance a distributed system of CM documentation and data sources to facilitate stakeholder access to information. Guidelines and standards are maintained to ensure consistent, seamless access to data and documentation.

4.3. Business Environment

Improvements in data, information and technology management have greatly enhanced business operations and helped facilitate better decision-making.

***Baseline Integrity*.** The thoroughness and completeness of the NAS Configuration Index is supported through the application of sound information management practices and techniques. Traceability of subsystems throughout the NAS life-cycle provides planners and evaluators effective impact analysis capabilities. Requirements are traceable from the NAS Architecture through lower level subsystem architectures. Technical, budget, and cost data are integrated. The transition of systems to

operational organizations is smooth and the appropriate documentation is associated with each configuration item. Baselines are easily established at the appropriate times and all interfaces have been properly identified and documented. The agency's ability to quickly ascertain the current installed base of NAS systems, including all modifications down to the LRU level has enhanced safety, reduced maintenance costs, and improved systems acquisition. Users are provided valuable information on system components, interfaces and relationships. The Agency's focus on CM of technical data, rather than documentation, has greatly enhanced the effective utilization of CM.

Requirements management work performed by ASD and ARS is accomplished through effective use of Document Object Oriented Requirements System (DOORS). The agency can easily trace and validate that detailed requirements and specifications have, in fact, been met in the operational environment. The integration of Asset Supply Chain Management, Modification Tracking and CM Status Accounting Systems allows the agency to easily manage NAS system baselines. CCDs are easily tracked back to the impacted requirements in a timely and effective manner.

Decision Support. CM is regularly relied upon to effectively support the decision process. The use of automated tools and web-based collaboration software has allowed "virtual" meetings. Corporate status accounting information is accurate and easily understood, thereby assisting decision-makers. Needed information from the corporate database is easily downloaded to standard local software (such as ACCESS and EXCEL) to conduct specific analyses. By using the same data, decision-making is better supported because all parties are working from a common set of information. Business rules are applied that ensure timely and accurate information so that decisions can be made as quickly and as reliably as needed.

Continuous process improvement. The investment in the enterprise business model has really paid off. This work, coupled with the policy and procedure activities, have firmed up CM requirements and verified CM data and information needs. This fundamental work was critical to the successful automation of NCP and other related CM processes. Technology application continues to facilitate the continuous process improvement by highlighting process bottlenecks and collecting key process metrics for process improvement analysis. Automation has contributed to significant reductions in process timelines and process analysis costs.

Elimination of costly duplicative practices. The introduction of ASCM and the integration of mod tracking capabilities have eliminated the need for "go-back" teams and has greatly facilitated efforts by second-level engineering organizations to improve the reliability of modification designs. The past proliferation of tracking databases and stakeholder skepticism regarding DOCCON and other centralized systems has ceased. CM stakeholders contribute to and rely on the CM core data infrastructure for their CM and data and information. The new system was designed with CM stakeholder needs in mind; they feel ownership and pride in the new system because it helps them execute their daily operational needs.

Traceability of requirements to actual installed base. The investment in data models and entity relationship analysis has really paid dividends. For the first time, the agency can easily trace and validate that detailed requirements and specifications have, in fact, been met in the operational environment. NCPs can be easily tracked back to the impacted requirements in a timely and effective manner. The work done by ASD and ARS in requirements management using the automated tool DOORS has dovetailed nicely into ASD-sponsored CMIM tool and database activities.

Paper is the exception rather than the rule. The acceptance of contract CDRLs in digital form provides an essential foundation for life cycle systems management. A web-based distributed system or Program Support Libraries (PSLs) and improved tool-based drawing management provide the latest

documentation quickly to all FAA sites. CM stakeholders have migrated from a reliance on paper to a preference for digital information.

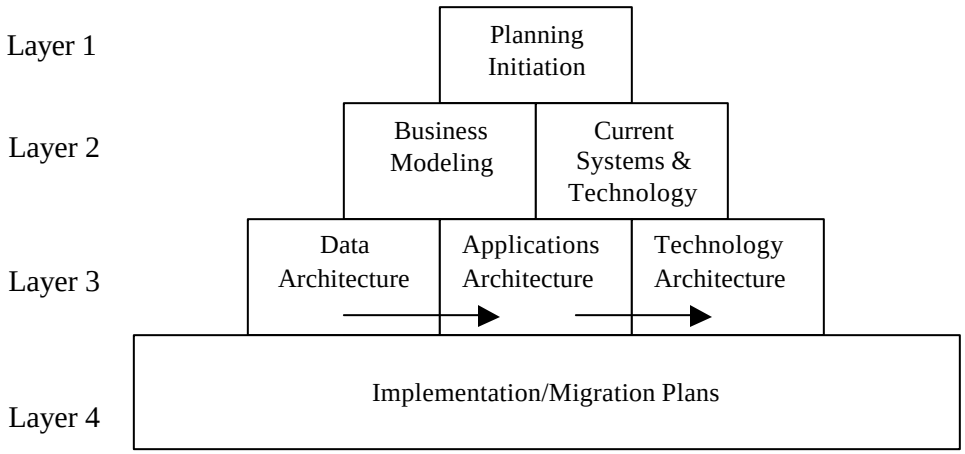
4.4. Graphical Representations of the Future State

The CMIM team has developed several preliminary graphics that depict various aspects of the future FAA CM information management environment. These views address the CM functional requirements as well as the technology infrastructure. These "pictures" will evolve as the information architecture is designed. Appendix B provides a brief introduction to each along with the pictures. These views include a Functional/Technology Hybrid View, Technology View and notional Stakeholder Desktop.

5. Information Architecture Design and Implementation

5.1. Information Architecture Planning

There are many professional practitioners in the field of system architecture. One of these is Dr. Steven H. Spewak, who has become a respected advisor, practitioner and author. Dr. Spewak was a featured speaker at the FAA Software Engineering Lecture Series in 1998. His book on Enterprise Architecture Planning (EAP) defines EAP as "***the process of defining architectures for the use of information in support of the business and the plan for implementing those architectures."*** Spewak's approach to EAP is similar to that taken by the Department of Energy (DOE) in that the business mission is the primary driver. That is followed by the data required to satisfy the mission, followed by the applications that are built using that data, and finally the technology to implement the applications. This hierarchy of activity is represented in Figure 2 below in which the layers are implemented from top to bottom. Based



Components of Enterprise Architecture Planning[4]
Figure 2

[4] Enterprise Architecture Planning: developing a Blueprint for Data Applications and Technology, Steven H. Spewak with Steven C. Hill, John Wiley & Sons, New York City, 1995; pg. 13.

upon the Business Systems Planning (BSP) approach developed by John Zackman, EAP takes a data-centric approach to architecture planning to provide data quality, access to data, adaptability to changing requirements, data interoperability and sharing, and cost containment. [5] Both of these gentlemen demonstrated the need and benefit of having a structured methodology.

This CM Information Architecture Concept of Operations and Design Strategy (CONOPS) builds upon these concepts as well as FAA experiences in the NAS Information Architecture and FAA Corporate Systems Architecture initiatives. This CONOPS provides the proposed strategy to incrementally design and implement a standards-based architecture that supports FAA CM business needs over the next three years. It focuses on the need to define and understand business operations first, identifying the data needed to support the operations and decision making inherent in that business, then develop information management solutions that enable the CM business to operate in an efficient and effective manner. Such solutions will include new policies, procedures, standards, and application of information technology where appropriate.

This CONOPS also provides a general framework for data, applications and technology by defining the desired characteristics of the target CM Information Architecture. This target or desired "end-state" will be used to help focus near and intermediate term CM information management activities.

5.2. CM Information Architecture Components

Building upon the work of Spewak and Zackman, the FAA CM target CM Information Architecture will include four key components: a detailed enterprise business model, data architecture, applications architecture and technology architecture.

5.2.1. CM Enterprise Business Model

Identifying the functions of the CM business is essential before defining architectures. The enterprise business model is a foundation for business process improvement and data management. The quality of the architectures is derived from the quality of the business model. The CM Process Team has done a fine job developing a high-level life-cycle process flow diagram, or business model, for FAA's CM business. To support further information modeling and analysis, that high-level process flow will be further decomposed to facilitate the documentation/analysis of information flows and the development of data models. A structured methodology or analysis framework will be utilized to ensure consistency with and traceability to CM Life Cycle CM Process Diagram. Over time, the collection of workflow modules and the Life Cycle CM Process Diagram will form the FAA's CM Enterprise Business Model. This effort will combine the work of several ASD-sponsored teams charged with defining FAA policy, procedures, guidance and standards. Information technology is an enabler. Defining business information needs in detail is a critical first step in building a responsive information architecture.

5.2.2. Data Architecture

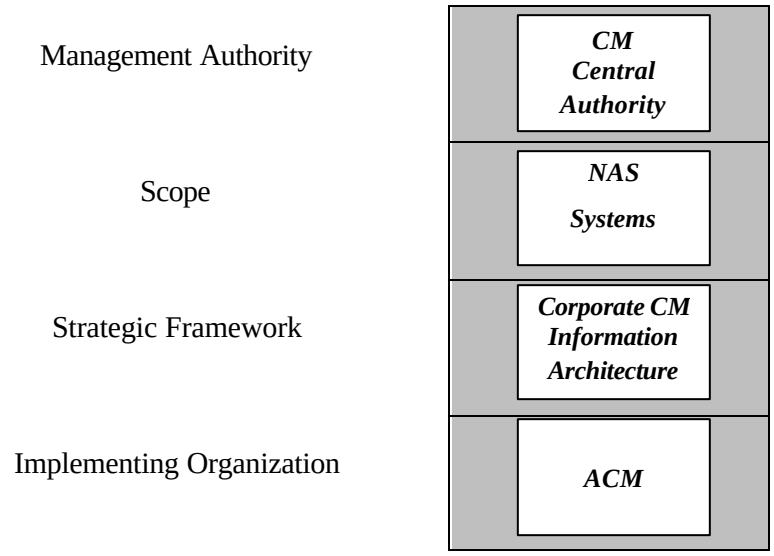
The CM data architecture will identify and define the major kinds of data that support the CM business functions documented in the Enterprise Business Model. The data architecture will consist of data entities, each of which has attributes and relationships with other data entities. This information will be published in a corporate CM data dictionary, which will serve as a critical information source for agency

[5] Draft NAS Information Architecture Initiatives, Architecture and Systems Engineering Division, ASD-100, February 1998

information system designers. It will define a core set of corporate CM data that will be maintained consistently in agency CM databases and systems to ensure data sharing across databases and systems.

The primary requirement is understanding the data needed for the business.[6]

Achieving consistent data definitions and shared data requires an oversight organization with the authority to define and implement data management policies and procedures on an enterprise basis.[7] In the CM area, ACM will serve in this role, in a collaborative effort with the CM community. The strategic framework for this architecture is represented in Figure 3.



Strategic Framework
Figure 3

CM data standards should build upon industry standards. These standards should be implemented, along with supporting procedures, in the enterprise CM policy slated to be published in the AMS and by FAA Order.

The quality of data is basic to the information management function. In addition, a concept of operations will be developed and initiatives defined to improve CM document management in the agency. Issues such as the future role of the Document Control Center (DCC) and Program Support Libraries (PSLs), standard Contractor Deliverables and others will be addressed.

[6] Architecture Survey Summary Report, Volume II, Architecture Survey Analysis by Organization Final Report, U.S. Department of Transportation Volpe National Transportation Center, July 1993; pg. 7-4

[7] Architecture Survey Summary Report, Volume II, Architecture Survey Analysis by Organization Final Report, U.S. Department of Transportation Volpe National Transportation Center, July 1993; pg. 1-21

5.2.3. Applications Architecture

The CM applications architecture will define the major kinds of system applications needed to manage CM data and support life cycle CM activities. The applications architecture is not a design for systems, nor is it a detailed requirements analysis. It is a definition of what applications will do to manage data and to provide information to CM stakeholders. As part of the Needs and Sources, the CMIM team documented existing CM and related applications in a "media view" (see Appendix A). A summary of those systems, data maintained, access, and points of contact were summarized in a CM Information Resources Catalog for stakeholder reference. That Catalog is posted on the FAA Corporate CM Web Page. After the business model is developed and data/information needs documented in detail, further analysis will be conducted to define/refine current applications, design/build new applications and design/build interfaces between applications to facilitate data access, processing and sharing.

As the Enterprise Business Model evolves, opportunities to leverage information systems and technology will be considered. Examples will include the tailoring of the automated tool (e.g., special input and output screens), metrics collection, status reporting and other applications. Data requirements from other supporting systems will be defined in detail, supporting the design of needed interfaces with the Modification Tracking capabilities under development by AOP, the Asset Supply Chain Management (ASCM) system now in the early requirements phase, and the NAS Architecture database, and others as appropriate. Once these applications opportunities are defined, more detailed requirements will be defined, options analyzed and presented to management for approval and resources (if needed beyond our projected budget base). Upon management approval, application design work will commence.

5.2.4. Technical Architecture

The CM technology architecture will define the major kinds of technologies needed to provide an environment for CM applications that are managing data. The technology architecture is a definition of the kinds of technologies, or platforms, that will support CM in a shared data environment. The technical architecture is a conceptual model defining those platforms that will reasonably support data and applications architecture requirements. Once data and applications architectures are defined, the supporting technology architecture, technology infrastructure design, will be developed. The technology architecture should not be defined independently from the other architectures. The CM technology architecture will also leverage the existing FAA installed technology base, and approved FAA desktop and other systems standards where applicable.

5.3. CM Information Architecture Design and Implementation Strategy

5.3.1. Approach

Over the next three years, the FAA will incrementally design the CM Information Architecture. This Concept of Operations will provide the conceptual framework to ensure that we develop component products with a broader future vision in mind. The realities of our environment dictate an architectural design strategy of "design a little, build a little." A structured methodology will be used to model CM business activities and related data elements and information products (i.e. documents, CD-ROMs, etc.). This methodology will be consistent with that used in the development of the life cycle CM Process Diagram. The automated tool VISIO will serve as the diagramming instrument, allowing traceability of CM functions back to the process Model as well as CM Policy and procedures documentation.

This approach is relevant to FAA's current situation for a number of reasons:

- ***Process maturity***. The CM community has made significant progress in recent months developing a life-cycle CM process model and agency CM policy. However, procedural guidance is outdated and many business rules not documented. Efforts are now underway to develop over 50 detailed CM procedures. These procedures will provide needed detail to document the FA CM enterprise business model and position us to utilize information technology as a powerful process enabler.

- ***Limited resources.*** Budget availability, or lack thereof, makes it difficult to fully develop a detailed information architecture before we build necessary components.

- ***iCMM.*** Incremental, continuous process improvement is consistent with FAA's iCMM and ARA's goals to meet iCMM milestones.

- ***Credibility with stakeholders***. Over the years, many good ideas have been shared throughout the community. Only a small percentage have come to fruition. Since establishment of the CMSG, the agency has made significant progress. We want to keep that momentum going. As stakeholders see more capabilities deployed, credibility beyond the CM practitioner community will grow. This will help achieve greater management support and justify future resource requirements for IM activities.

This approach allows the CMIM team to leverage on-going FAA initiatives that are related to and supportive of our future vision. Figure 4 provides a mapping of the documented CM information requirements from the needs analysis to on-going FAA initiatives. The CMIM team will work with these efforts to define needed future interfaces.

Mapping CM Information Needs
To CMIM and Other Information Management Initiatives

CM Information Requirements	*Strategies for Satisfying Requirements*
1. The ability to identify and communicate the existing operational configuration of NAS hardware, down to the Lowest Reportable Unit (LRU) level, and NAS software systems.	• Asset Supply Chain Management system interface • DOCCON replacement
2. A process that provides all necessary information necessary to efficiently and effectively manage change proposals to the National Airspace System (NAS).	• EDMS-CM Tool Pilot • Enterprise tool • National procedures • DOCCON replacement • AUA Database and Web Activities
3. More timely access to CM -specific documentation, supporting documentation and CM basic information to execute CM and program management responsibilities.	• Document management concept of operations • FAA Corporate CM Web Page • Distributed infrastructure of Program Support Libraries • "Virtual" Document Control center
4. Easily accessible and accurate drawings of commissioned sites and equipment.	• EDMS-CAEG • Updated Drawing Management Standards
5. An accurate and responsive FAA life-cycle corporate status Accounting system.	• DOCCON replacement
6. Traceability from the NAS-level requirements to actual configuration items.	• Enterprise Business Model • Data models • Database interfaces (e.g., NAS Architecture database, Mod tracking, etc.)
7. Other information to ensure efficient and effective CM operations.	• Automated Tool reporting

Figure 4

In addition, such an approach will help build credibility with stakeholders as they continue to see incremental design and deployment of a corporate solution to improve CM information management will help The CM Information Architecture will be designed, and components built, in modules. Each module will address all of the following four components the strategic framing of the CONOPS in mind. Our approach will be focus on an open, standards-based, architecture that will leverage the current installed FAA information technology infrastructure, to the maximum extent practical, as well as approved FAA information technology standards.

Change Management is the core CM activity most widely recognized by agency professionals. NCP processing, in particular, touches many agency professionals; it was a top priority concern of most stakeholders interviewed for the CM information needs analysis. Given the issues associated with NCP process responsiveness and effectiveness and the demonstrated benefits of automated workflow tools, NCP processing is a logical area to focus our initial CM information management improvement activities and serve as the first module of the CM information architecture. Each Change Management architectural component will define necessary linkages and interfaces with other CM activities and information sources. Such interfaces will be considered for future work in later Architecture Phases.

5.3.2. Implementation

This section describes the incremental approach for designing, developing and implementing the CM Information Architecture and core CM information infrastructure over the next three years.
Each year, each component of the architecture (enterprise business model, data architecture, applications architecture and technology architecture) will be developed and incrementally enhanced. This CONOPS and Design Strategy will be updated periodically to incorporate lessons learned as well as changes in the FAA CM information environment. Detailed schedules and milestones will be addressed in the CM Program Plan and CMIM Program Plan documents.

In 1999, the focus and emphasis will be on NCP processing. The NCP process will first be fully documented (including the workflow or business model, data dictionary, data schemas, automated tool functionality and technology infrastructure designed). Once the automated tool is fully implemented by the selected vendor, the CMIM team will continue to analyze other CM functional needs. The next priority will be status accounting and configuration identification – two tenets fundamental to CM and key to the replacement of DOCCON. From there, the CMIM team will continue to address the other CM functional requirements.

In parallel with this effort, the CMIM team will establish partnerships with other FAA organizations that manage databases critical to the successful implementation of CM. Such alliances have bee established with the Mod Tracking initiative (sponsored by AOP-100), the Asset Supply Chain management (ASCM) initiative (requirements definition sponsored by ARS) and others. Such alliances will pursue data interface opportunities to provide CM stakeholders with the wide variety of information they need to provide CM support throughout the NAS life cycle.

The following paragraphs provide more detailed overview for the coming three years.

5.3.2.1. 1999 Focus Areas

CM Enterprise Business Model. A set of detailed NCP process flow diagrams will be developed to support the design/tailoring of the selected automated workflow tool. To ensure that the full range of NCP processing requirements are addressed, ASD will establish several workgroups to define NCP

processing activities in great detail. For each task/activity, the groups will identify responsible individuals/organizations, activity inputs and outputs, and the underlying business rules that govern the execution of the activity, relationships among process activities and data/information processing requirements. The final product, a full documentation of the NCP process, will be used to communicate NCP process requirements to the tool vendor to facilitate tool workflow programming. The methodology developed for this task will serve as the foundation for further business analysis and eventual completion of the Enterprise Business Model.

In addition to the NCP processing area, the CMIM team will continue to participate on agency workgroups charged with defining requirements and developing applications critical to the execution of effective CM. Areas of initial emphasis will include:

- Modification tracking
- Asset Supply Chain Management
- NAS requirements management

Significant work is on going in these areas, areas defined during the needs analysis as of paramount concern to the effective and efficient configuration of the NAS.

Data Architecture. In coordination with the NCP process workflow development, the inputs and outputs of process entities will be defined at the data level, data sources identified, existing systems and file descriptions (such as those currently defined in the DOCCON data dictionary) reviewed, and data element attributes and document relationships defined. Related to this initiative is the establishment of data interface and exchange standards with the AUA WebCM database. Products from this effort will include an initial corporate data dictionary of CM data elements (focusing on NCP and related data needs), entity relationship models and data schemas. These products will be presented to the automated tool vendor, along with the NCP process flow diagrams, to facilitate logical database design, physical database design and database creation. Although the database will be designed to address NCP processing initially, it will be structured with the longer-term vision of replacing/decommissioning DOCCON in the 2000/2001 timeframe.

Also in 1999, a document management concept of operations will be developed. This document will include an inventory of current CM documentation; define roles, responsibilities, and desired outcomes; and establish a vision of FAA's future CM documentation management environment. The goal is to define and then establish a corporate, distributed infrastructure of Program Support Libraries (PSLs) to ensure that CM documentation is consistently acquired and maintained while ensuring needed access to CM stakeholders in a timely, cost effective manner. Draft standards will be developed to ensure that contractor-provided CM documentation is consistent in format (both data content and electronic media) to facilitate sharing across organizational and geographic lines.

Applications Architecture. Developing a pilot NCP processing application is the main priority in 1999. A COTS tool workflow is a marvelous engine for managing generic organizational data, but without explicit instruction, and in many cases custom programming, it is useless. A tool engine that has not been instructed how to correctly represent the FAA CM Change Management information and processes will not work in the FAA culture. Significant efficiencies can be achieved, but only if the application is fully responsive to the agency's specific NCP processing needs. In concert with NCP workflow and data model work, data and information processing requirements will be defined and provided to the vendor. This design input will be used to adapt the tool from the generic vendor-provided template into one that adequately represents FAA data relationships and processes. A template has been developed as a framework for functional operation statements.

The success of the Tool Pilot depends in no small part on user involvement, and on the initial release of system being delivered to the target users sooner rather than later. Prototyping will ensure that users are involved up-front in the design process, making it much more likely that a final delivery will be accepted by the field. A user group will be established to assist in this area. Some tool vendors offer short-term, high intensity customization based on RAD and prototyping that may reduce the need for some extensive "paper" design work, particularly in the design of user interfaces and the layout of work flows. Such services will be incorporated into this effort if available from the selected tools vendor.

Concrete examples will be emphasized, including the validation of the need for existing forms and reports (e.g., NCP form, MCI report, etc.), and the markup of required changes. This information will be organized for presentation in a comprehensible format as a straw man example of the required system functionality. Achieving consistency in field definitions, picklists, validation and access and security issues will be critical to the success of this effort.

The major activities involve logical data and user interface design. The purpose is to clearly identify what will be included in the final information system, and how it is intended to function. The results of this phase is a document describing in detail the functions the new information system will perform, and how information will be organized and transmitted throughout the system.

To ensure the pilot is manageable, we plan to work with NCPs that affect a limited number of Configuration items managed by two IPTs. Other participants in the pilot will include ACM, ANS, AGL, ASW, AOS (Tech center and OKC), AML and ACT organizations. The other seven regions will continue to process NCPs in the current manual paper form to enable a assessment of "paper vs. electronic" NCPs processing.

Another area of priority is the CM Web Page. Since June 1998, the page has provided basic information and links to internal FAA and external sites of CM interests. In 1999 the page will be redesigned to better organize existing information and position the site to serve more as a “one-stop-shopping” portal for CM information. The addition of other documents and links, and text search and database capabilities will be pursued.

Technology Architecture. Once the vendor is selected, and the workflow documentation is shared, a schematic will be developed to identify the platforms and communications required to implement the pilot. Specific participants will be identified and existing telecommunications links, platforms, etc. will be assessed to ensure tool pilot success. An assumption going into the pilot is that existing PCs, FAA cc:Mail, and ADTN 2000 and FTS2000 will be utilized. Lessons learned from this effort will be used to design the necessary technology architecture to support implementation of the Enterprise Tool in 2001.

5.3.2.2. 2000 Focus Areas

CM Enterprise Business Model. Using the modeling methodology developed for the NCP workflow documentation, additional models for the remaining areas in the life cycle process flow. Status Accounting and Configuration Identification will be priority areas or “modules” because they are fundamental to the replacement of DOCCON. Information requirements from outside traditional CM information sources will be documented. Alternative strategies for acquiring such information, though direct information systems interfaces or other means, will be documented and evaluated.

In addition to the NCP processing area, the CMIM team will continue to participate on agency workgroups charged with defining requirements and developing applications critical to the execution of effective CM.

Data Architecture. Data work will continue along with the expansion of the Enterprise Business Model. After initiation of the Tool Pilot, data activities will focus on the refinement of data models to support the 2001 deployment of an enterprise tool and replacement of the corporate master configuration index and status accounting databases currently maintained in DOCCON. Guidance for the establishment and operation of Program Support Libraries will also be published. Emphasis will also be placed on defining standards for CM data and documentation to support standard language/corporate guidance for FAA statements of work.. A mechanism will be established, under the lead of the CM Authority, to gain consensus on CM data standards and to consider data element changes in an organized manner.

Applications Architecture. Emphasis will be placed on two activities:

- Define requirements define and complete procurement activities for acquiring an enterprise automated tool to support NCP processing and other core CM data needs; and
- Define requirements and design a corporate status accounting database that will replace the current DOCCON system.

Upon expected successful completion of the pilot, ASD will pursue the acquisition and implementation of an enterprise-wide tool to fully automate the NCP process nation-wide. ASD has developed an estimate of the software, hardware, services and other resources that will be needed to design, build and deploy and COTS-based enterprise tool. As the tool pilot progresses, the team will document lessons learned and begin to develop a detailed plan for managing this effort. More detailed planning for this activity is currently anticipated for the summer/fall of 2000. As work progresses, updated information will be fed to the budget process to strengthen justification for needed funding and related resources.

In addition, other DOCCON functionality (beyond NCP processing) will be reassessed and design requirements developed.

As the CMIM team continues to build the Enterprise Business Model, opportunities for improved manual and automated information processes shall be identified. Applications or interfaces to existing systems will then be developed in a planned, organized corporate fashion based upon available resources and priorities.

***Technology Architecture*.** Emphasis will be placed on designing the network architecture for the enterprise tool and DOCCON replacement.

5.3.2.3. 2001 Focus Areas

CM Enterprise Business Model

- Enterprise Business Model for all CM functional and activities is completed

Data Architecture.

- Corporate CM Data Architecture
- Corporate CM Data Standards published.
- CDRL Standards fully implemented.

Applications Architecture.

- FAA CM Applications Architecture
- Enterprise Tool is procured, installed and implemented across the agency.
- The DOCCON replacement is brought on-line.
- Required interfaces have been fully defined and strategies to implement such interfaces approved. Interface design, development and implementation are well underway or complete (depending on maturation of systems with which we must interface)

Technical Architecture.

- FAA CM Technology Architecture
- Core enterprise information infrastructure in place (tool and DOCCON replacement properly networked to allow needed access to CM stakeholders across the agency. Hub servers are deployed, as needed, to ensure responsive processing.
- Future expansion requirements defined and resource requirements included in the budget.

6. Risks

The risks associated with successful design and implementation of a standards-based architecture include the following:

Management and CM Stakeholder Commitment. The NCP Pilot can only be successful with the active participation and contribution of pilot participants. Using the tool for a sample of CM NCP workload will add some short-term additional burden to some organizations, but this workload should be viewed as a long-term investment in CM processing efficiency and effectiveness. There is also a considerable amount of process and data analysis that must be conducted to complete the architecture. This work often takes time and provides minimal short-term payoff. The potential for long-term benefit is considerable, but the potential for reassigning resources to address other short-term CM priorities continues to jeopardize this work.

***Resources*.** The budget allocated for the pilot is relatively small. Therefore, in-house resources will be needed to fully document workflow requirements. If such resources continue to be sidetracked to other priorities, it will jeopardize pilot success.

***Technology*.** There are always risks associated with implementing new technology. In addition, this project is relying largely on existing FAA desktop computers, telecommunications and network infrastructure.

7. Program Planning

A CMIM program plan will be developed to map out specific initiatives, schedules, resources and products to be delivered for the CM Information Architecture. Major deliverables and milestones will be highlighted in the CM Program Plan, sponsored by the CMSG.

Appendix A The "As-Is" CM Information Architecture

As a part of the above needs assessment, the CMIM interview team documented those information sources currently used or available to support CM activities and decision making. Figure 1 provides a high level picture of these source from a "media view."

These systems have been documented in an Information Resources Catalog (e.g., name of system, system purpose, information available, points of contact, etc.). This resources catalog is included as an appendix of the final report (January 1999 Final Edition) and is posted on the FAA Intranet Page. Some of the very important goals of the CM Information Architecture are to help us better manage this information and provide broader, timelier access, to CM stakeholders when they need CM and related information.

A myriad of automated and manual information repositories exist throughout the agency. Corporate automated tools are cumbersome, often utilizing outdated technology. "Pockets" of inconsistent information are maintained by numerous organizations. Each source has invested in database and other technologies to improve information management. This application has been inconsistent at best.

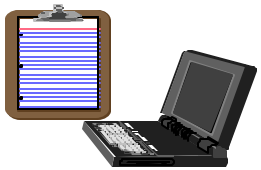
The core corporate source for CM data is the Documentation and Identification System (DOCCON) Program Control Tool. DOCCON is an interactive, menu driven database system that stores information about baselined and non-baselined documents and configuration items (CI)s) and tracks proposed changes to the National Airspace System (NAS). DOCCON is hosted on the ICEMAN platform executing the MVS/ESA operating system with the time sharing option (TSO). Since 1985, DOCCON has served as the primary source of CM data for NAS baseline metadata.

Numerous offices in Headquarters, the regions and the field have created their own databases that either duplicate or augment DOCCON. These "pockets" of data are not coordinated or integrated. Without corporate standards and an architectural framework, organizations continue to develop new media sources. Information collection is inconsistent, with significant gaps and little or no validation. There is a lack of accountability for information timeliness, accuracy and reliability. Beyond the data elements established in the DOCCON, there are no CM data and information management standards published and invoked. CM data is widely viewed as a "program" or "local" asset, further complicating the agency's ability to collect and assess CM data corporately.

DOCCON only addresses metadata. The CM function relies heavily on paper-based workflow (particularly the Casefile and NAS Change Proposal processes) and document management. The need for improving Cm document management has been reviewed numerous times, most recently by the Automated Documentation Development and Maintenance (ADDM) initiative [8]. ADDM sought to use information technology to improve document management, version control and

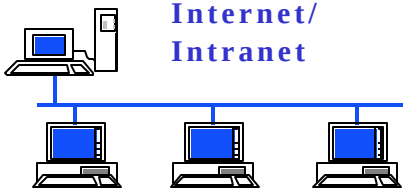
[8] Automated Documentation Development and Maintenance (ADDM) Final Draft Version 3.0; Volpe National Transportation Systems Center, January 1993

CM Information Architecture "As-Is" Media View



- CF & ME Lists (AAL)
- CF & NCP Lists (ANS)
- En Route XStream (AUA)
- AFSS/ATCT Change History (AGL)
- AFSS/ATCT Baselines (AGL)
- AFSS/ATCT NCP Tracking (AGL)
- CF Tracking System (ANW)
- NCP Tracking System (ASO)

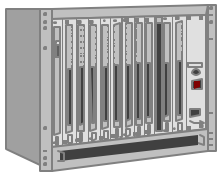
IPT / Region-Specific Lists, Trackers



Internet/ Intranet

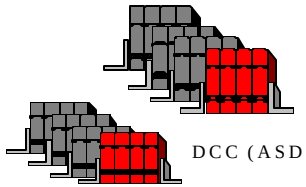
- FAA Intranet Page (AIT)
- Technical Library (AOS-200)
- CM Page (ASD)
- MID (AOS)
- NASI (ASD)
- En Route Program (AUA)
- TDWR Site (AND)

Corporate Information Systems

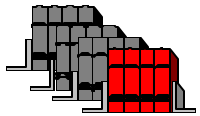


- DOCCON (ASD)
- LIS (AML)
- MMS (AOP)
- NDW (AAF)
- AF-WIS (AFZ)
- NIMS (AND)
- TIMS (AOP)
- FMF (AOP)

"Other" CM and Related Databases



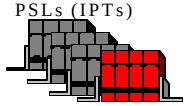
DCC (ASD)



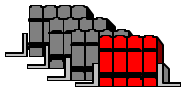
NASDOC (AOS)

Technical Documentation

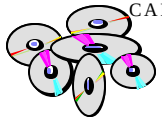
PSLs (IPTs)



PSLs (Regions)



FRDFs



CAEG (regions)

AOS-530

Tools

Workflow Management

- CCC/Harvest (AOS)
- En Route XStream (AUA)
- DOORS (ASD/ARS)
- Lotus Notes (AND)

- MIS (AOS)
- NPRS (AOS)

See Acronym definitions on next page.

access. Since that time, technology has changed dramatically, providing lower cost opportunities to better manage documentation. These functions are not well documented and do not employ available information technology effectively. Work is now underway to develop detailed procedures in 50 CM activity areas and a new policy is under review. This positive progress provides an opportunity to improve the way we manage information. A holistic approach is needed to ensure we address all aspects of CM information management; an information architecture will provide a much needed framework to guide future information management initiatives.

"As-Is" CM Information Architecture Acronym List

AF-WIS	Airway Facilities Workload Information System
AFSS	Automated Flight Service Station
AMS	Acquisition Management System
ATCT	Airport Traffic Control Tower
CAEG	Computer Aided Engineering Graphics
CF	Case File
DCC	Documentation Control Center
DOCCON	Documentation and Configuration Identification system
FMF	Facilities Master File
FRDF	Facility Requirements Data File
LIS	Logistics and Inventory System
LTS	Library Tracking System
ME	Must Evaluator
MID	Modification Index Database
MIS	Management Information System
MMS	Maintenance Management System
NASDOC	National Technical Documentation library
NASI	National Air Space Information system
NDW	National Data Warehouse
NCP	NAS Change Proposal
NIMS	NAS Infrastructure Management System
NPRS	National Problem Reporting System
TDWR	Terminal Doppler Weather Radar
TIMS	Telecommunications Information Management System

Appendix B – Target CM Information Architecture Conceptual Views

The following designs are early conceptual drafts that describe the target architecture from a functional, technology and applications perspective. As the Enterprise Business Model evolves, these concepts will be refined.

Appendix B1: Functional and Technology Platform Hybrid

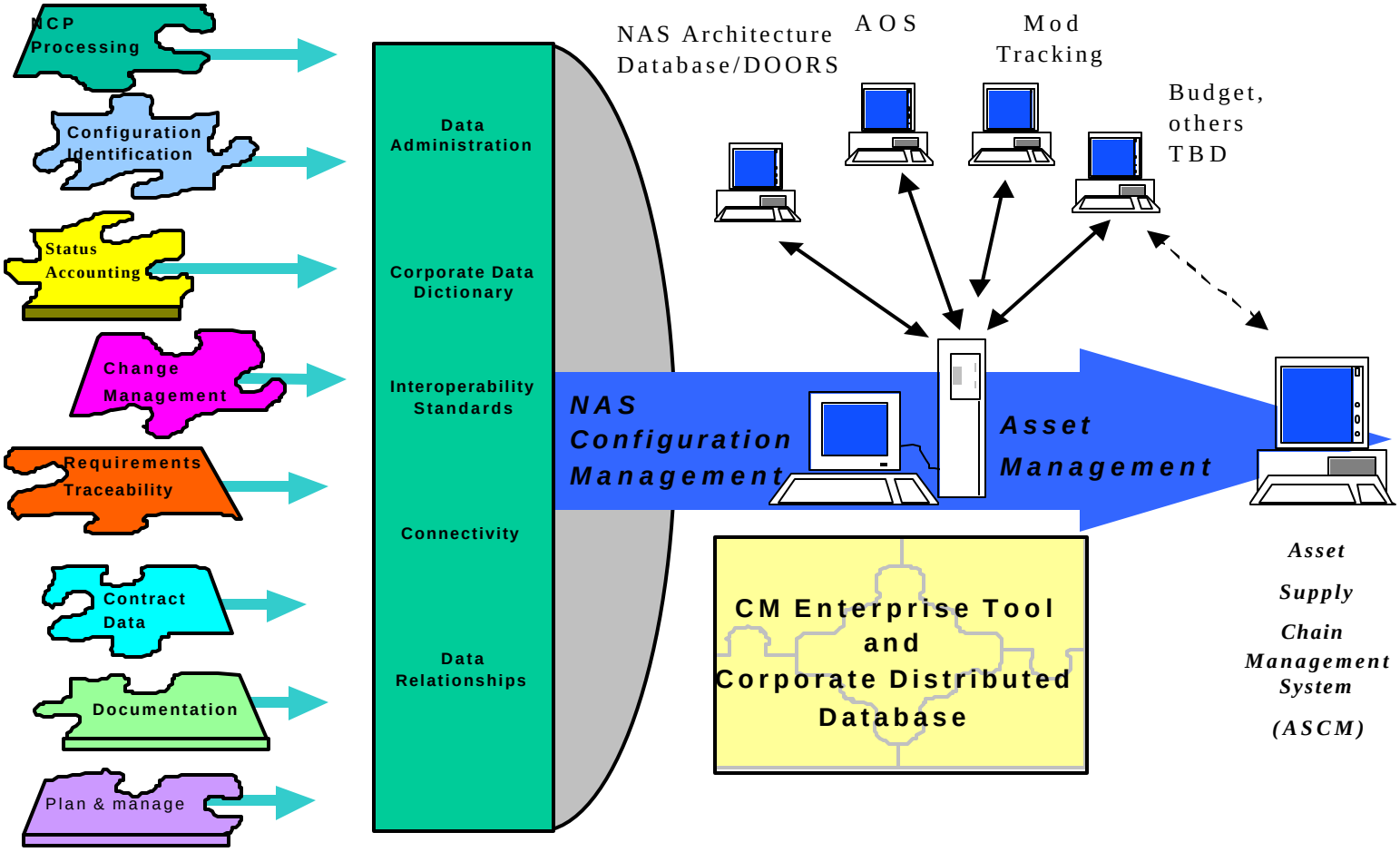
This view provides a high-level conceptual framework showing a combination of the core CM functionality requirements along with the current and projected key systems needed to support CM operations . The Enterprise Tool, and supporting Corporate Database, will serve as the nucleus for future design, development and expansion of CM information management capability. The business model and gap analysis will facilitate linkage definition, at the data level, with existing and planned support systems. To date, the Mod Tracking System, NAS Architecture Database, DOORS (operated by ASD and ARS) and AOS tracking systems will be pursued. Additional opportunities to link CM information sources to the to budget and other systems, shall be defined during Enterprise Model development.

Appendix B2: Technology Infrastructure

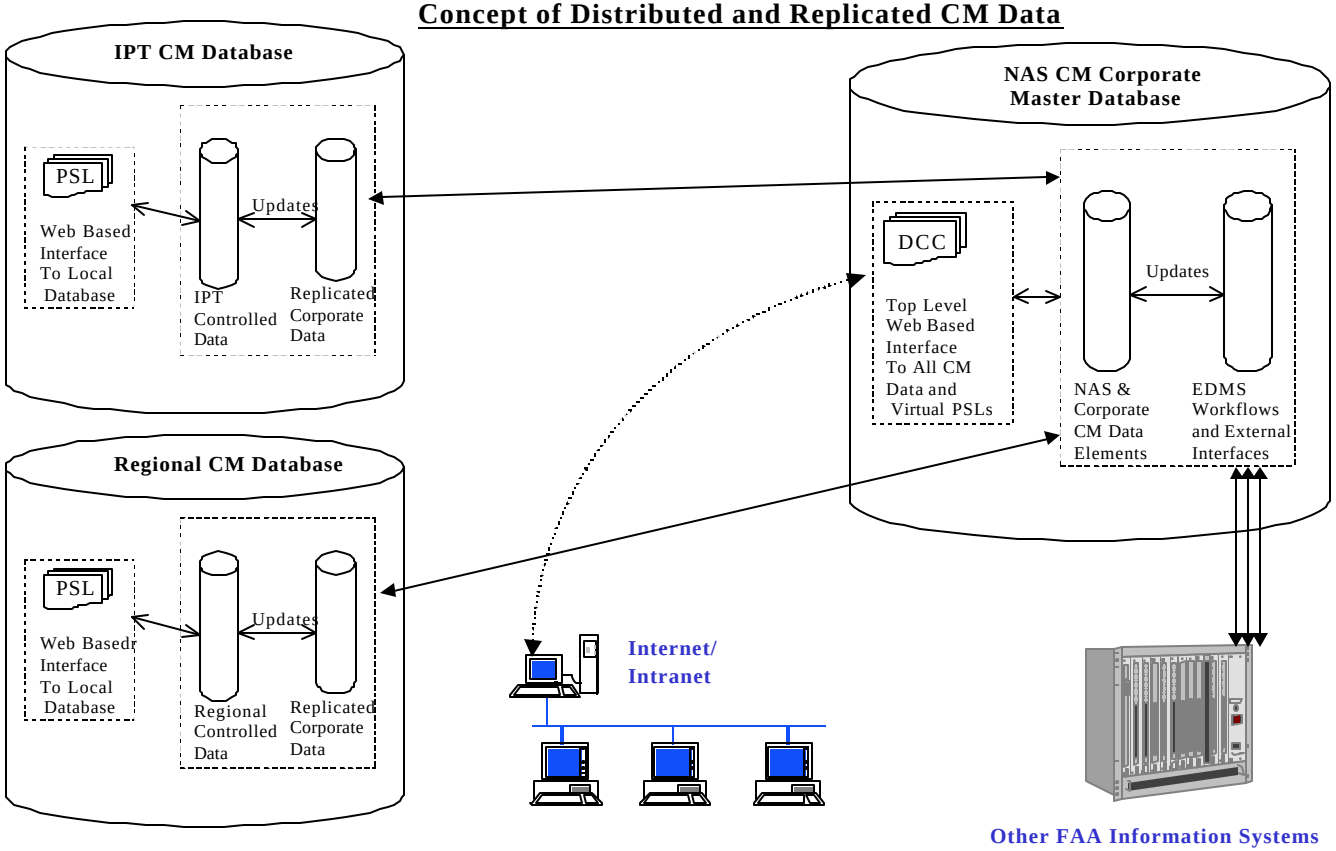
This view highlights the desire to establish hubs of information at the main CM stakeholder sites. These sites will be responsible for posting CM data and documentation within a corporate framework. IPT and Regional-specific data, for example, will reside locally. Data included in the core corporate set of CM data will be provided to the corporate database for NAS level analyses as well as for use by other CM stakeholders in planning for interface planning and other related needs. Each IPT, Region and Second-level engineering organization will also post CM documentation in HTML format based on corporate guidelines. ASD will provide linkages to such sites, creating a "virtual Document Control Center" through the Internet.

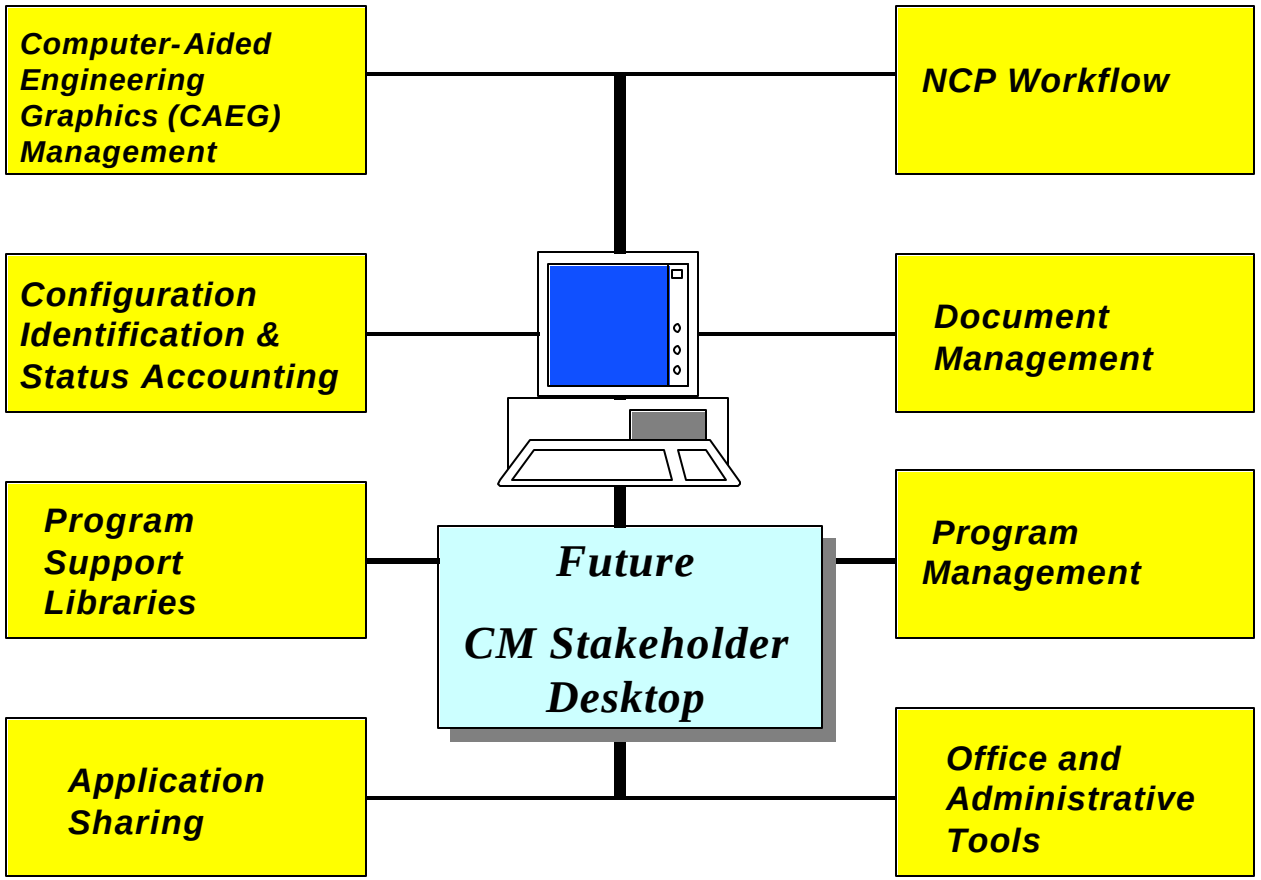
Appendix B3: CM Stakeholder Desktop

This graphic provides a summary of the target functionailty to be available to CM stakeholders at their desktop.


NCP Processing
Configuration Identification
Status Accounting
Change Management
Requirements Traceability
Contract Data
Documentation
Plan & manage
Data Administration
Corporate Data Dictionary
Interoperability Standards
Connectivity
Data Relationships
NAS Architecture Database/DOORS
AOS
Mod Tracking
Budget, others TBD
NAS Configuration Management
Asset Management
CM Enterprise Tool and Corporate Distributed Database
Asset Supply Chain Management System (ASCM)

Concept of Distributed and Replicated CM Data




Computer-Aided Engineering Graphics (CAEG) Management
NCP Workflow
Configuration Identification & Status Accounting
Document Management
Program Support Libraries
Future
CM Stakeholder Desktop
Program Management
Application Sharing
Office and Administrative Tools

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Military Handbook, Configuration Management Guidance, MIL-HDBK-61, 30 September 1997.